1,194,089

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,194,089

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COMPLETE SPECIFICATION

Improvements in or relating to Telephone Receiving Apparatus

I, LEONARD RICHARD KAHN, a citizen of the United States of America, of 81 South Bergen Place, Freeport, Long Island, State of New York, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a head mounted circuit control system wherein movement of the head effects change of operating mode of an associated electrical circuit. Specifically disclosed typical systems comprise a headset having a pair of soundproof earphones adapted to be worn over the ears of a user to shield him from environmental noise, with receiver circuitry connected to speakers in the earphones for permitting the user to selectively listen to communications from associates. Mercury-type switch means are mounted on the headset and electrically connected between the activatable circuitry means for permitting the user to turn the activatable circuitry on or off simply by a tilting of the head.

In my co-pending application No. 8616 (Serial No. 1183232) filed February 23, 1967 and entitled Improvements in or Relating to Hearing Protection Systems, there is disclosed a hearing control system for the suppression of high level acoustical energy which might be damaging or distracting to a worker in a noisy environment, while permitting the user to selectively hear relatively low level acoustical energy such as voice communications from associates in the environment. As described this hearing control system comprises a headset including a pair of soundproof earphones physically interconnected by a spring band, a pair of microphones in proximity to the earphones for converting acoustical energy to electrical signals, a series of signal modifying circuits for increasing the level of the audio intelligence energy of the signals from the microphones relative to the noise energy of such signals, and sound translation means housed within the earphones for converting the output signal from the modifying circuits to an acoustical signal which can be heard by the user.

The modifying circuits include alternatively or conjunctively applied clipper circuit means for limiting the amplitude of each incoming signal to about the peak-to-peak level of the audio intelligence contained in the environmental acoustical energy, a pre-emphasis network for accentuating the higher frequencies of the incoming signals, a bandpass filter for removing from the incoming signals all frequencies other than the audio frequencies making up most of the audio intelligence, and a variable frequency notch filter for nulling a selected frequency to suppress a given type of environmental noise (e.g. electric motor hum).

A series of manual switch means are provided on the earphones for permitting the user to selectively connect or disconnect any or all of the modifying circuits, and a manual on-off switch is provided for each earphone, permitting the user to selectively turn the receiver off and thus completely isolate himself from the environmental acoustical energy.

When a user of the hearing control system of the aforementioned application is engaged in a task requiring a high degree of concentration and desires to isolate himself from environmental noise, he must manually turn the on-off switch means on the earphones to the off position; and when he later desires to listen to communications

[Price 5s. 0d.]

from an associate he must again manually move the switch means back to the on position. If the user is engaged in a task which requires the use of both hands, he must interrupt his work to operate the switches. Obviously, this may be inconvenient and inefficient, particularly in situations where it is necessary for the user to continuously switch the receivers on and off.

A similar problem arises with the use of hearing control devices with radio communications systems, which devices are often employed where the environmental noise level is high. Such a radio communications system typically includes a headset having a pair of soundproof earphones housing receiver units, a shielded microphone housing a transmitter unit, and hand-operated switches for permitting the user to selectively turn the transmitter on and the receiver off, and vice versa. If the user is engaged in a task requiring the use of his hands, it is often distracting and inconvenient for him to manipulate the switches.

According to the invention there is provided a receiver circuit and a control system therefor comprising, apparatus to be worn on the head of an operator and including earphone means adapted to generate sound to be heard by the operator, a source of electric currents, such as a receiver circuit, connected to the earphones and a mercury switch means mounted on the apparatus and responsive to the position of the apparatus for switching the source of electric currents between an on and off condition, whereby the operator selectively maintains the source in either an on or off condition by holding the apparatus in a desired position.

Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawing, in which:

Figure 1 diagrammatically and schematically presents the components of a binaural noise control system embodying the invention, and a view of the headset thereof, which is constructed in accordance with the teachings of the present invention and including tilt-sensitive mercury switches for turning the receiver circuits off and on;

Figure 1A is an enlarged detail view showing one of the mercury switch means of the assembly shown in Figure 1; and

Figure 2 diagrammatically and schematically presents the components of a two-way radio communication system incorporating a hearing control system embodying the present invention, with tilt-sensitive mercury switch means for turning the communications system receiver and transmitter circuits off and on.

The hearing control apparatus 10 shown in FIG. 1 is of the same general type described in detail in the aforementioned copending application No. 8616/67, (Serial No. 1183232), except for the switch means for turning the receiver units off and on, and reference may be had to that application for a detailed description of this type of system. Generally, the system comprises a pair of earphones 12 and 12′, suitably of a type generally conventional per se, comprising housings lined with foam or like sound absorbent material (not shown) for substantially completely isolating the right and left ears of the wearer from directly hearing the acoustical energy generated in the surrounding environment. Also housed in the earphones 12 and 12′ are conventional sound translation means (not shown), such as magnetically actuated diaphragms, for example, which function to convert electrical signal energy to acoustical energy. The headset of the system 10 further includes a spring band 14, conventional per se, interconnecting the earphones 12, 12′, and a mercury switch means 16, 16′ mounted on the band, substantially as shown.

A pair of microphone pickups 18, 18′ are located in the ambient environment, in respective proximity to the earphones 12, 12′, so as to be directly and binaurally responsive to the environmental acoustical energy and convert such to electrical energy. The microphones 18, 18′ are suitably of a type conventional per se, and typically located on the spring band 14 in respective proximity to the earphones 12, 12′, or can be placed in any other convenient location on the person of, or near, the user. The electrical energy outputs from the microphones 18, 18′ are fed to amplifiers 20, 20′ and then to one or more signal modifying circuits 22, 22′ wherein such signals are modified to increase the level of the audio intelligence energy relative to the noise energy thereof. The output signals from the signal modifying circuits 22, 22′ are fed to summation circuits 24, 24′. Inputs to the summation circuits 24, 24′ are from jacks 26, 26′, which give the user the option of monitoring in one or more AF inputs from one or more radio receivers (not shown) or the like, while being protected from the distractions and/or damage incident to severe ambient and environmental noise. The signal outputs from the summation circuits 24, 24′ are fed through amplifiers 28, 28′ and the tilt-sensitive switch means 16, 16′ to the earphones 12, 12′, respectively.

As schematically shown in FIG. 1, the mercury switch means 16, 16′ are responsive to tilting movement of the headset to connect or disconnect the receiver circuits from

the earphones 12, 12'. Thus, noting the view of FIG. 1, if the headset is tilted to make right earphone 12' relatively lower than left earphone 12, the receiver circuits are activated by being electrically connected to the earphones 12 and 12' through engagement of the respective mercury globules M, M' with respective wire contacts C, C', thereby enabling the user to hear modified energies originating in the energies picked up by the microphones 18 and 18', respectively. With the headset in the upright position (the position shown in FIGS. 1 and 1A) or tilted to the left (with earphone 12 lower) the receiver circuits are disconnected from the earphones 12, 12', and the user is substantially completely isolated from environmental noise. Thus, in use, the user wearing the headset would only have to tilt his head toward his right if he desired to hear acoustical intelligence from an environmental associate, thereby leaving his hands free to continue performance of the task in which he is engaged. While FIG. 1 as shown and as above discussed relates to a so-called binaural type two-channel audio system, it will be apparent that a monaural or single channel system would employ a single tilt switch 16 or 16' with associated signal channelling, with the single audio energy output being fed tp one or two earphones 12, 12'. Evident also will be the utilization of the arrangement shown at FIG. 1 for two independent audio channels, such as when radio inputs 26, 26' are derived from independent radio receivers, with one of the switches M, M' being reversely arranged in this event to enable the wearer to hear one circuit with his head tilted in one direction and the other circuit with his head tilted in the other direction.

Of course, mercury switch means 16, 16' can be arranged to electrically connect or disconnect the receiver circuitry to the earphones when the headset is upright or tilted toward the left or right.

Suitable adjustment means can be provided for adjusting the angular disposition of each mercury switch means 16, 16' relative to the band 14. Thus, as typically shown in FIGS. 1 and 1A, each switch containing mercury globules M, M' is typically retained, as by upset tabs, on a pivotally movable mounting plate 29, 29', independently lockable in a set position by means of respective set screws 30, 30'.

The circuit and control system shown in FIG. 2, adapted for use with a two-way type communication system, includes a headset 50 comprising a pair of soundproof earphones 52, 52' which house suitable sound translation diaphragm means (not shown) and are interconnected by a spring band 54. The headset 50 further includes a proximately located microphone 56, supported by conventional means (not shown), which is responsive to the voice energy of the wearer of the headset.

Conventional receiver circuit 58 is electrically connected to the earphones 52, 52' through a first mercury switch 60 which is mounted on the spring band 54; and a conventional transmitter circuit 62 is electrically connected to the microphone 56 through a second mercury switch 64, also mounted on the spring band.

Suitable switch mounting and adjustment means, such as respective pivotally movable mounting plates 66, 68 and set screws 70 and 72 (suitably of like form as shown at 29, 29', 30 and 30' in FIGS. 1 and 1A), are provided for realizing the desired angular positions of the mercury switches 60 and 64 relative to the headset 50.

If the headset 50 is either level or is tilted towards the wearer's right (as viewed in the view thereof in FIG. 2), switch 60 is closed and receiver circuit 58 is electrically connected to the earphones 52, 52', thereby enabling the user to hear incoming communication. Simultaneously, in these positions, the transmitter circuit 62 is disconnected from the microphone 56. If the headset 50 is tilted toward the wearer's left (as viewed in FIG. 2) the transmitter circuit 62 becomes electrically connected to the microphone 56, and the receiver circuit 58 is disconnected from the earphones 52 and 52', thereby enabling the wearer to transmit.

Thus, the user of the system can switch from a receiving mode to a transmitting mode by simply tilting his head.

As will be apparent, set screws 68, 70 provide means whereby the wearer can set the switches 60, 64 to establish both the transmitter circuit and the receiver circuit, or either thereof, in an activated condition when the headset is in a level or "no tilt" attitude.

Mercury switches 60 and 64 can be arranged to electrically connect or disconnect either or both the receiver means and transmitter means to or from their respective earphones and microphone when the headset is upright or tilted toward the right or left.

As will be apparent, the circuit control system of the present invention is adaptable to a wide variety of uses in its broader aspects, either combined with hearing protection (i.e. with ear protectors), or without. Thus, by way of further example, a mobile, transceiver equipped user who is otherwise manually occupied but who does not need or desire hearing protection in the particular use environment present, may simply wear a headband or helmet mounted switch means and establish the transceiver in either transmitting or receiving mode by

movement of his head.

While the invention has been shown and described herein with reference to preferred embodiments thereof, it is to be understood that other variations and applications thereof may be made by those skilled in the art without departing from the scope of the following claims.

WHAT I CLAIM IS:—

1. A receiver circuit and a control system therefor comprising, apparatus to be worn on the head of an operator and including earphone means adapted to generate sound to be heard by the operator, a source of electric currents, such as a receiver circuit, connected to the earphones and a mercury switch means mounted on the apparatus and responsive to the position of the apparatus for switching the source of electric currents between an on and off condition, whereby the operator selectively maintains the source in either an on or off condition by holding the apparatus in a desired position.

2. A receiver circuit and control system therefor as claimed in claim 1 wherein the apparatus to be worn on the head includes two earphones and a metal band connecting the earphones together.

3. A receiver circuit and control system therefor as claimed in claim 2 wherein the mercury switch means is secured to the head band.

4. A receiver circuit and control system therefor as claimed in claim 3 wherein the mercury switch means is secured to an adjustable bracket on the head band whereby the angular position of the mercury switch means to the head band may be altered.

5. A receiver circuit and control system therefor as claimed in claim 3 wherein the mercury switch means maintains the receiver circuit in its off position when the apparatus is upright and the switch maintains the receiver in its on position when the apparatus is tilted to one side.

6. A receiver circuit and control system therefor as claimed in claim 3 wherein the mercury switch means includes two switches, one of which connects two terminals together when the apparatus is tilted to one side and a second which connects two other terminals together when the apparatus is tilted to the other side.

7. A receiver circuit aand control system therefor substantially as hereinbefore described with reference to the accompanying drawings.

LEONARD RICHARD KAHN
per: BOULT, WADE & TENNANT,
112, Hatton Garden, London, E.C.1.
Chartered Patent Agents.

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1,194,089 COMPLETE SPECIFICATION
1 SHEET

Fig. 1.

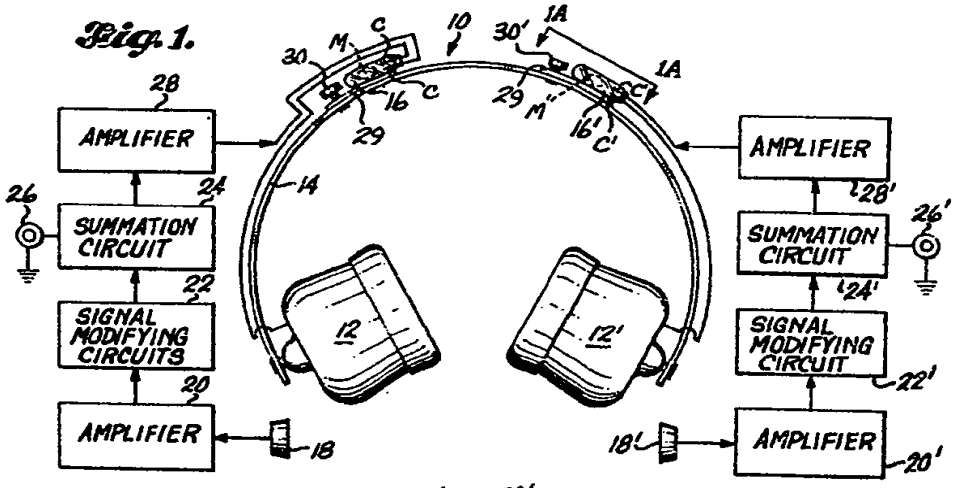
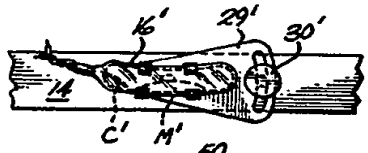


Fig. 1A.



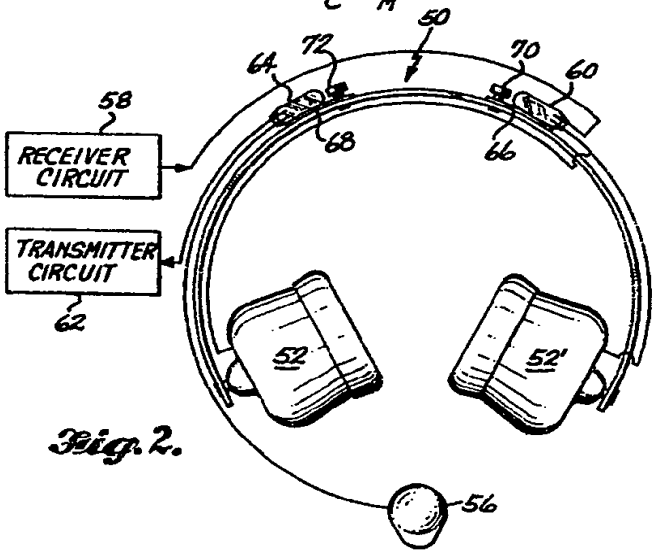


Fig. 2.